

REMARKS

Claims 25-34 and 37-48 are currently pending in this application. Claims 1-24, 35 and 36 have been cancelled, without prejudice.

Claim 25 has been amended to clarify that the C₄-C₁₈ alcohols, diols of the type represented by HO-R-OH or tetrahydric alcohols based on erythritol or both is added to the melamine resin precondensate after the concentration-increase process. This amendment is supported by original claim 1 and in the specification. No new matter has been added to the application by the foregoing amendment.

Claims 25-34, 37, and 39-48 have been rejected under 35 U.S.C. §103(a) as being obvious over Borner et al. (WO 02/40564, equivalent U.S. 2004/0024131) in view of Adams (U.S. Patent No. 2,473,463) and in further view of Michel et al. (U.S. Patent No. 4,271,286).

The Office Action contends that Borner et al. allegedly teaches a direct synthesis process for preparing etherified melamine resin condensates wherein: (a) in the first step of the reaction, an etherified melamine resin precondensate is prepared in alcoholic solution (methanol, see Example 1, allegedly meeting the limitations of claim 27 and claim 28) with formaldehyde (allegedly meeting the limitations of claims 29 and 31) at a temperature of 20-100°C (allegedly meeting the limitations of claim 34 and newly added claim 48); and (b) in the first step, the concentration of the etherified melamine resin precondensate in alcoholic solution allegedly is increased, C₄-C₁₈ alcohols (C₄ butanol, see Example 1). The Office Action contends that Borner et al. allegedly teaches re-concentration of the product after addition of 2L of methanol, which allegedly can be considered as a second vaporization step (see Example 1). In a second step of the reaction, the increased-concentration melamine resin precondensate allegedly is reacted, using a mixer (extruder, see Example 1).

With respect to claim 26, the Office Action contends that Borner et al. allegedly teaches that after the second step of the reaction, the etherified melamine resin condensate is discharged and pelletized (granulated) (see Example 2). With respect to claims 29-30, the Office Action contends that Borner et al. allegedly teaches a process, which takes place at a pH of 6.5-9, preferably 7-8 (see line 0030). With respect to claims 41-42, the Office Action contends that Borner et al. allegedly teaches using a highly vented extruder

(see claim 9). The Office Action contends that although Borner et al. does not teach the details of the extruder, it would have been obvious to a person of ordinary skill in the art that it should have a very effective vapor removal system, since harmful formaldehyde releases during the process. With respect to claim 43, the Office Action contends that Borner et al. allegedly teaches addition of up to 60% of particulate additives (see line 0040).

The Office Action acknowledges that Borner et al. does not teach a molecular weight of 500 to 50,000. However, the Office Action contends that since the resulting resin is pelletized, this suggests that its molecular weight is at least 500.

The Office Action acknowledges that Borner et al. does not disclose any exact solid content after vaporization (i.e., before the extrusion). However, the Office Action contends, it would have been obvious to a person of ordinary skills in the art to obtain 95-99% solids in Borner et al.'s process in order to make the extrusion procedure more effective and to provide a low amount of aggressive volatiles to avoid any safety, corrosion and health issues during the above step of the process. Therefore, the Office Action concludes, it would have been obvious to a person of ordinary skill in the art to load an extruder with highly concentrated solid product in order to avoid corrosion and health issues during the above step of the process. The Office Action notes that Borner et al. teaches addition of butanol after the neutralization step; which allegedly makes a trans-esterification process improbable. Therefore, the Office Action contends, the Borner et al. polymer is not free from $\text{NH-CH}_2\text{-O-CH}_2\text{-NH}$, since methylol groups tend to react with each other. The Office Action acknowledges that the Borner et al. process has a disadvantage of releasing poisonous formaldehyde during the kneading process. However, a product having longer alcohol allegedly has better elasticity.

The Office Action acknowledges that Borner et al. does not teach melamine resin condensates free from hydroxymethyleneamino groups bonded to the triazine rings of the melamine resin condensate and from $\text{-NH-CH}_2\text{-O-CH}_2\text{-NH-}$ groups linking triazine rings.

The Office Action contends that Adams allegedly teaches a process for making a fully methylated melamine-formaldehyde composition, which is obtained by trans-etherification with butanol (see Examples, particularly Example 3), wherein the first step represents methylation with a subsequent etherification. The above process allegedly is well known in the industry and prevents additional polymerization of formaldehyde to

paraformaldehyde. The Office Action contends that Adams allegedly teaches an etherification process at pH 5.5-6.5 (see column 4, line 65, allegedly meeting the limitations of claims 30 and 31) at 86-91°C (see column 6, line 15, allegedly meeting the limitations of claim 34) and a melamine-formaldehyde ratio of 1:3 (see Example 3, allegedly meeting the limitation of claim 35). The Office Action contends that Adams allegedly teaches both simultaneous and sequential processes (see Examples). Also, the Office Action contends that Adams allegedly teaches that the increased concentration of the condensate after vaporization is 10-85%.

With respect to claim 33, the Office Action contends that Adams allegedly discloses a process in the presence of ion-exchange resins (see Example 3). With respect to claim 37, the Office Action contends that Adams allegedly teaches two step distillation (see Examples). With respect to claim 40, the Office Action contends that Adams allegedly teaches addition of acid-modified butanol (see Examples). Therefore, the Office Action contends, it would have been obvious to a person of ordinary skill in the art to modify the Borner et al. process with Adams, since it will lead to a safer process (no poisonous gas released during the extrusion) and create a product with better mechanical properties (i.e., elasticity). In addition, the Office Action contends that Adams's process allegedly prevents forming a by-product (polyparaformaldehyde), which can deteriorate the performance of the target composition.

The Office Action acknowledges that Borner et al. and Adams do not teach the new limitation of claim 25, which claims a solid content of etherified precondensate in an alcoholic solution within the range of 65-85% wt. The Office Action contends that Michel allegedly teaches a process for preparation of methyloltriazines etherified with alkanols in which the reaction of melamine; formaldehyde and methanol with a following evaporation step provides a reaction product having a solid content of 75% wt. (see Example 1). The Office Action contends that Michel's process allegedly achieves high storage stability of the resulting precondensate along with economical advantages. The solid content of Michel's product allegedly is low enough to avoid undesirable crystallization of the precondensate and high enough for handling of the solution (i.e., transportation, piping, etc.) (See column 1, line 65). Also, the Office Action contends that this step is advantageous for economical reasons, for example having highly concentrated melamine resin requires lower apparatus volume,

needed for further pre-concentration before the extrusion step, is much easier to handle, and evaporating less solvent requires less demanding drying equipment. For instance, a composition having 75-85% of resin content requires only a heater with metal pane with venting, whereas a liquid composition requires a vacuum reactor with stirrer.

Therefore, the Office Action contends, it would have been obvious to a person of ordinary skill in the art to pre-concentrate the melamine resin to 65-85%, achieving solid state material in order to provide more economical and technologically sound processing.

Applicants respectfully, but strenuously, traverse this rejection and request that the rejection be reconsidered and withdrawn.

As reiterated by the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.*, 550 U.S. ___, 82 U.S.P.Q.2d 1385 (2007), the framework for the objective analysis for determining obviousness under 35 U.S.C. §103 is stated in *Graham v. John Deere*. Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in *KSR International Co. v. Teleflex Inc.*, 72 Fed. Reg., No. 195 (October 10, 2007) at page 57527 (hereinafter "Examination Guidelines"). The factual inquiries enunciated by the Court are as follows:

- (1) Determining the scope and content of the prior art;
- (2) Ascertaining the differences between the claimed invention and the prior art; and
- (3) Resolving the level of ordinary skill in the pertinent art.

Examination Guidelines at page 57527.

"The ultimate determination of patentability must be based on consideration of the entire record, by a preponderance of evidence, with due consideration to the persuasiveness of any arguments and any secondary evidence." Manual of Patent Examining Procedure, (Sept. 2007) §716.01(d) and In re Oetiker, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992).

Borner et al. describes the synthesis and processing of 2,4-diamino-1,3,5-triazine aldehydes resins. Substituted 2,4-diamino-1,3,5-triazines are reacted with an aldehydes, such as formaldehyde, to form unetherified aldehyde-triazine resins in a basic environment. In a second step, the unetherified resin is then etherified with a C₁-C₁₂ alcohol under acidic conditions (see paragraph [0023]). Such obtained resins are only partially etherified and still contain —NH-CH₂-O-CH₂-NH- groups. The excess alcohol is removed

by distillation, thus increasing the concentration of the etherified resin (see Example 1).

Adams teaches a process for preparing of liquid alkylated melamine-formaldehyde compositions by reacting methanol, melamine and formaldehyde in a first step and transesterifying the obtained condensate with propanol or butanol in a second step (see column 1, lines 10-30, example 3-5). Only after the final product in the form of a liquid composition is obtained is the product concentrated or diluted to yield products comprising 10-85 wt% of resin (column 5, lines 1-5, Examples 3 and 5).

Michel et al. relates to a process for the preparation of etherified methylolaminotriazines by reacting melamine as aminotriazine and formaldehyde in NaOH solution followed by etherification with an alkanol, e.g., methanol in acidic conditions. The etherified melamine is concentrated to a solids content of 75 wt% (column 4, line 41, Example 1).

Thus, none of the above-cited documents, taken alone or combined as set forth in the Office Action, suggests or discloses:

- (1) a two step vaporization process for concentrating the etherified melamine resin precondensate up to a concentration of 99 wt%, or
- (2) the addition of a diol for transesterification after the concentration-increase process.

The Office Action contends that it would be obvious to a person skilled in the art to obtain a 95-99 wt% melt of etherified melamine resin precondensate.

Applicants respectfully disagree.

Increasing the concentration of a precondensate melt over 85 wt%, especially up to 95-99 wt%, is not a trivial and obvious process. In order to obtain a melt with a concentration over 85 wt% various technical aspects have to be considered.

The concentration process is accompanied by extreme foam formation and a viscosity increase. Therefore, the first vaporization step is carried out in a thin-film vaporizer with a rotational speed of 1400 U/min, which is used for melts having low viscosities.

In the second vaporization step, however, only a vaporizer with a lower rotational speed of 400 U/min can be used. Such a slow vaporizer acts as a foam breaker and thus allows a further concentration of the melt up to 95-99 wt%. At the exit of the second vaporizer, the melt is almost free of solvent. This is absolutely required for further work-up

of the melt in the extruder. Otherwise, the melt would not reach the reaction temperature above 200°C in the extruder in a timely manner required for the build up of the molecular weight.

If the second vaporization step is omitted and the melt enters the extruder at a concentration of less than 85 wt% (or 75 wt% according to Michel et al.), repeated solvent evaporation occurs in the extruder. This in turn would cause a delay in the temperature increase to the required reaction temperature in the extruder. This would require more energy and extruders of enormous length to obtain the required residence time at the required temperature.

Thus, it would not be obvious to a person skilled in the art to obtain a melt with concentrations higher than 85 wt%. This can also be deduced from the fact that none of the cited references discloses a melt having a concentration above 85 wt%.

The advantages of adding an alcohol for transesterification after the concentration-increase process are as follows:

After the second concentration step, the melt exists as a syrupy melt with a concentration of up to 99 wt%. The paste is metered via a feeding pump and a feeding line into the extruder (or kneader) where the molecular mass build up and procuring occurs. By adding the alcohol to the melt at this stage, the viscosity of the syrupy melt is decreased. This in turn reduces the adhesion of the melt to the wall of the feeding line and therefore the transport of the melt in the feeding line is improved.

Furthermore, the addition of the alcohol to the highly concentrated melt also lubricates the feeding pump so that the addition of an otherwise necessary lubricant is avoided, e.g., the addition of graphite as lubricant would decrease the procuring and product quality. If instead the alcohol was added before the second vaporization step, the addition of a lubricant would be required.

A good mixing of the syrupy melt and the alcohol is achieved by metering the alcohol into the slot of the sliding ring of the gear wheel feed pump. If the alcohol is added at a different process step, e.g., before the second vaporization step, a static mixer would be required in order to obtain a good mixing result. Static mixers, however, are characterized by certain dead zones which can promote blocking in the feeding line between the feeding pump and extruder.

Furthermore, the addition of colder alcohol to the melt having a temperature above 120°C cools the melt. Cooling is desirable since it promotes foam breaking. However, the minor cooling effect is does not adversely affect fast heating of the melt in the extruder.

To summarize, none of the above-cited documents, taken alone or combined as set forth in the Office Action, suggests or discloses a two step vaporization process for concentrating the etherified melamine resin precondensate up to a concentration of 99 wt%, or the addition of a diol for transesterification after the concentration-increase process and its technical advantages. Thus, the process according to amended claim 25 would not be obvious to a person skilled in the art in view of the disclosures of Borner et al. in view of Adams and in further view of Michel et al. Claims 26-34 and 37-48 depend directly or indirectly from claim 25, and are distinguishable from the cited references for at least the same reasons as those set forth above with respect to claim 25. Accordingly, Applicants respectfully request that the rejection be reconsidered and withdrawn.

Claim 38 has been rejected under 35 U.S.C. §103(a) as being obvious over Borner et al. in view of Adams and Michel et al., as applied to claims 25-34, 37, 39-48 above, and further in view of Horacek (U.S. Patent No. 5,206,066). The alleged teachings of Borner et al., Adams and Michel are discussed above. The Office Action acknowledges that Borner et al., Adams and Michel et al. do not teach diol as the etherification agent. The Office Action contends that Horacek allegedly discloses a melamine-formaldehyde resin, modified with diol (See Abstract and column 2, line 30), such as 1, 4 butane diol. The Office Action contends that it would have been obvious to a person of ordinary skill in the art to use diols in Borner/Adam's processes in order to achieve low shrinkage during curing and high flexibility.

Applicants respectfully, but strenuously, traverse this rejection and request that the rejection be reconsidered and withdrawn.

Horacek discloses melamine resins obtained by a process of mixing etherified melamine-formaldehyde resins with diols until a certain viscosity is reached (see Example 1). The resin is characterized by high formaldehyde content. In contrast to Horacek, the present process uses a lower melamine/formaldehyde ratio of 1:2 to 1:4.

Horacek also does not suggest a process comprising two vaporization steps and addition of an alcohol after the concentration-increase process according to present claim

25.

Furthermore, in contrast to Horacek, the presently claimed invention does not relate to pelletizing but rather to melt solidification using a double roller and breaking of the particles. In the process of melt solidification, the melt is cooled from 130°C to lower than 40°C by pressing the melt to a disc and thus increasing its surface. The disc is broken down in large pieces followed by its conversion to bulk material. The bulk material is suitable for gravimetric solid metering. Pellets according to Horacek, however, are not suitable for this purpose.


Thus, the process according to amended claim 25 would not be obvious to a person skilled in the art in view of the disclosures of Borner et al. in view of Adams and Michel et al., and further in view of Horacek. Claims 26-34 and 37-48 depend directly or indirectly from claim 25, and are distinguishable from the cited references for at least the same reasons as those set forth above with respect to claim 25. Accordingly, Applicants respectfully request that the rejection be reconsidered and withdrawn.

Reconsideration and withdrawal of the rejections and allowance of the pending claims is respectfully requested.

Should the Examiner have any questions of any nature regarding this Amendment, he is invited to contact Applicants' undersigned representative by telephone.

Respectfully submitted,
THE WEBB LAW FIRM

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